

CHROMOSOME NUMBERS IN PENSTEMON (SCROPHULARIACEAE) I: NEW MITOTIC COUNTS

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Living plants of *Penstemon* were collected for cytological analysis by Delzie Demaree, Dr. W. G. Dore, Dr. Dennis Knight, and the authors. These were transported to the University of Wisconsin greenhouses and botanical garden, where they have been grown for two successive years. Root-tips were used exclusively.

Initially, root-tips were sectioned and stained with crystal-violet, but most of the preparations were made by a new orcein technique (Kawano, unpublished). Excised root-tips were stored in 0.001-0.002 mol. 8-hydroxyquinoline aqueous solution for 4-6 hours at 17-20°C, then fixed in Östergren & Heneen's fixative overnight, then treated with 5% aqueous pectinase for 1-2 hours at 30-38°C, and subsequently stained in lactopropionic orcein (Dyer, 1963) for more than 6 hours. The root-tips were then transferred into lactopropionic orcein-1 N hydrochloric acid (1:1) in which they were allowed to remain for 30 seconds to 5 minutes. Each of the root-tips was then transferred to a glass slide, treated with a drop of propionic acid (45%)-glycerine (9:1) for 5 to 20 seconds, after which it was gently heated over an alcohol flame and the root-tip squashed.

Since part II of this series, a revue of the cytology of *Penstemon*, is in preliminary manuscript, and will be published soon, no discussion of the taxonomic ramifications of the new counts is presented here. The new counts, together with voucher specimens, are cited below. Metaphase drawings are presented in Figure 1.

***Penstemon arkansanus* Pennell. $2n = 16$.**

(including *P. multicaulis* Pennell and *P. wherryi* Pennell)

ARKANSAS. FAULKNER Co.: 2 mi. e. of Conway, *Crosswhite & Crosswhite* (WIS); 4-5 mi. n. of Conway, *Crosswhite & Crosswhite 62-325* (WIS). FRANKLIN Co.: 7 mi. w. of Ozark, *Crosswhite & Crosswhite 62-310* (WIS). GARLAND Co.: Hwy. 7, 1 mi. s. of Hamilton Lake, *Crosswhite & Crosswhite 62-320* (WIS). HOT SPRINGS Co.:

Big Hill Creek, 2 mi. n. of Bismark, *Crosswhite & Crosswhite 62-322* (WIS). INDEPENDENCE Co.: 5 mi. s. of Batesville, *Crosswhite & Kawano 63-407* (WIS). JACKSON Co.: 2 mi. s. of Denmark, *Crosswhite & Kawano 63-408* (WIS). LOGAN Co.: 8 mi. s.e. of Paris, *Crosswhite & Crosswhite 62-314* (WIS). PERRY Co.: 3½ mi. s. of Hollis, *Crosswhite & Crosswhite 62-318* (WIS). SALINE Co.: 1 mi. e. of Owensville, *Crosswhite & Crosswhite 62-324* (WIS). YELL Co.: 2 mi. n. of Havana, *Crosswhite & Crosswhite 62-315* (WIS).

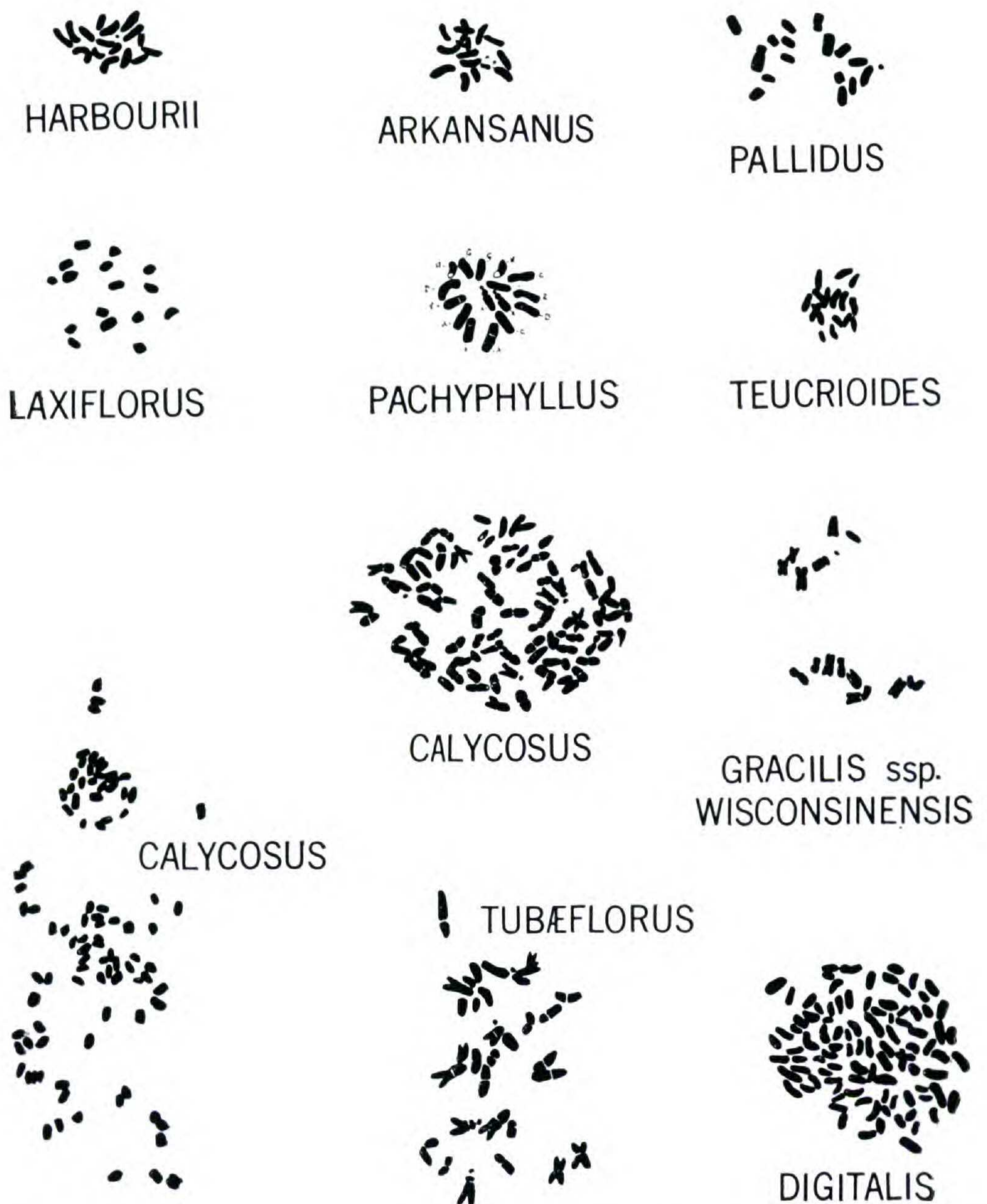


Fig. 1. Camera-lucida drawings of the chromosome complements of several *Penstemon* taxa.

Penstemon calycosus Small. $2n = 96$.

ILLINOIS. MARSHALL Co.: 2 mi. n. of Lacon, *Crosswhite & Crosswhite* 62-305 (WIS). SHELBY Co.: 9 mi. s. of Pana, *Crosswhite & Crosswhite* 62-330 (WIS). WASHINGTON Co.: 2 mi. s. of Irvington, *Crosswhite & Crosswhite* 62-239 (WIS).

Penstemon digitalis Nutt. $2n = 96$.

ARKANSAS. PERRY Co.: 3 mi. s. of Hollis, *Crosswhite & Crosswhite* 62-317 (WIS). SHARP Co.: 1 mi. s. of Hardy, *Crosswhite & Kawano* 63-414 (WIS). LOUISIANA. EVANGELINE PARISH: Chicot State Park, *Crosswhite & Kawano* 63-415 (WIS). MISSOURI. MILLER Co.: 5 mi. s.e. of Eldon, *Crosswhite & Nickerson* 62-306 (WIS). WISCONSIN. RICHLAND Co.: Richland Center, *Crosswhite* 63-412 (WIS). SAUK Co.: Lake Delton, *Crosswhite & Crosswhite* 63-413 (WIS). ONTARIO: Jaspar, *Dore* 19184 (WIS).

Penstemon gracilis Nutt. ssp. **gracilis**. $2n = 16$.

SOUTH DAKOTA. DEUEL Co.: 4 mi. e. of Clear Lake, *Knight s.n.* (WIS). PENNINGTON Co.: Mt. Rushmore, *Crosswhite & Crosswhite* 63-400 (WIS). WISCONSIN. TREMPEALEAU Co.: Trempealeau, *Crosswhite* 63-401 (WIS).

Penstemon gracilis ssp. **wisconsinensis** Pennell. $2n = 16$.

WISCONSIN. ADAMS Co.: 2 mi. n. of Plainville, *Crosswhite & Crosswhite* 62-303 (WIS); Friendship, *Crosswhite & Crosswhite* 62-304 (WIS). WAUSHARA Co.: Plainfield, *Crosswhite & Crosswhite* 63-402 (WIS).

Penstemon grandiflorus Nutt. $2n = 16$.

WISCONSIN. ADAMS Co.: New Rome, *Crosswhite & Crosswhite* 63-416 (WIS).

Penstemon harbourii A. Gray. $2n = 16$.

COLORADO. GUNNISON Co.: Mt. Belleview, *Crosswhite* 62-221X (PH, RM, SMU, WIS).

Penstemon laxiflorus Pennell. $2n = 16$.

ALABAMA. MOBILE Co.: Creola, *Crosswhite & Kawano* 63-411 (WIS). LOUISIANA. GRANT PARISH: 15 mi. s. of Winnfield, *Crosswhite & Kawano* 63-409 (WIS). EVANGELINE PARISH: 5 mi. n. of Turkey Creek, *Crosswhite & Kawano* 63-410 (WIS).

Penstemon pachyphyllus A. Gray ssp. **pachyphyllus**. $2n = 16$.

UTAH. UINTAH Co.: 13 mi. n. of Vernal, *Crosswhite & Crosswhite* 62-254X (PH, RM, SMU, WIS).

Penstemon pallidus Small. $2n = 16$.

ARKANSAS. INDEPENDENCE Co.: ½ mi. s. of Cave City, *Crosswhite & Kawano* 63-405 (WIS). SHARP Co.: 5 mi. s. of Ash Flat, *Crosswhite & Kawano* 63-406 (WIS). ILLINOIS. JACKSON Co.: Giant

City State Park, *Crosswhite & Kawano 63-404* (WIS). WASHINGTON Co.: s. of Centralia, *Crosswhite & Kawano 63-403* (WIS).

***Penstemon teucroides* Greene.** $2n = 16$.

COLORADO. GUNNISON Co.: Almont, *Crosswhite & Crosswhite 62-229X* (PH, RM, SMU, WIS); Sapinero, *Crosswhite & Crosswhite 62-230X* (PH, RM, SMU, WIS).

***Penstemon tubaeiflorus* Nutt.** $2n = 32$.

ARKANSAS. CRAIGHEAD Co.: 1 mi. n. of Jonesboro, *Crosswhite & Crosswhite 62-328* (WIS); 5 mi. s. of Jonesboro, *Crosswhite & Crosswhite* (WIS). CRAWFORD Co.: 4 mi. n. of Mountainberg, *Crosswhite & Crosswhite 62-313* (WIS). JOHNSON Co.: Ozone, *Crosswhite & Crosswhite 62-309* (WIS).

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